Table 1. Required courses in the BIOLOGY track.

Course	PLO 1 explain basic concepts, methods & theories of the natural sciences	PLO 2 Describe and explan biologic concepts; describe and apply scientific methods in biology	PLO 3 independently undertake laboratory investigations; explain & follow safety protocols for teaching laboratories	PLO 4 demonstrate observational and experimental skills	PLO 5 apply scientific concepts, methods, and theories to problems of societal relevance	PLO 6 communicate scientific knowledge, orally and in writing, to a variety of audiences.
Required all tracks						
BIOL 171-172	I	I	I		I	
CHEM 161-162	I		I		I	
PHYS 170-272 or PHYS 151-152	I		I		I	
GEOL 111-112	I		I		I	
BIOL 171L-272L, CHEM 161L-162L, PHYS labs, GEOL 111L-112L	I		I, D, M	I, D, M		I, D
MATH 121 or BIOL 280	I					
MATH 125 or MATH 241	I					
NSCI 476		M			M	M
Required in biology track						
BIOL 125 or 270		I				
BIOL 275-275L		D	D		D	
BIOL 281		D				
BIOL 357		D				
UD BIOL elective		D,M				
UD BIOL elective		D,M				

Table 2. Required courses in the CHEMISTRY track.

Course	PLO 1 explain basic concepts, methods & theories of the natural sciences	PLO 2 Describe and explan chemical concepts; describe and apply scientific methods in chemistry	PLO 3 independently undertake laboratory investigations; explain & follow safety protocols for teaching laboratories	PLO 4 demonstrate observational and experimental skills	PLO 5 apply scientific concepts, methods, and theories to problems of societal relevance	PLO 5 communicate scientific knowledge, orally and in writing, to a variety of audiences.
Required all tracks						
BIOL 171-172	I	I			I	
CHEM 161-162	I	I	I		I	
PHYS 170-272 or PHYS 151-152	I	I			I	
GEOL 111-112	I	I			I	
BIOL 171L-272L, CHEM 161L-162L, PHYS labs, GEOL 111L-112L	I	I	I, D, M	I, D, M		I, D
MATH 121 or BIOL 280	I	I				
MATH 125 or MATH 241	I	I				
NSCI 476			M		M	M
Required in chemistry track						
CHEM 141		I			I	
CHEM 360		D			D	
CHEM 320		D				
CHEM 274-274L		D	D	D		
BIOL 125 or CHEM 241		I				
AQUA 425 or ENSC 301 or CHEM 431-431L		D,M	M (CHEM 431L)	M (CHEM 431L)	D (ENSC 301) M (AQUA 425)	

Table 3. Required courses in the EARTH SCIENCE track.

Course	PLO 1 explain basic concepts, methods & theories of the natural sciences	PLO 2 Describe and explan earth science concepts; describe and apply scientific methods in earth science	PLO 3 independently undertake laboratory investigations; explain & follow safety protocols for teaching laboratories	PLO 4 demonstrate observational and experimental skills	PLO 5 apply scientific concepts, methods, and theories to problems of societal relevance	PLO 6 communicate scientific knowledge, orally and in writing, to a variety of audiences.
Required all tracks						
BIOL 171-172	I		I		I	
CHEM 161-162	I		I		I	
PHYS 170-272 or PHYS 151-152	I		I		I	
GEOL 111-112	I	I	I		I	
BIOL 171L-272L, CHEM 161L-162L, PHYS labs, GEOL 111L-112L	I		I, D, M	I, D, M		I, D
MATH 121 or BIOL 280	I					
MATH 125 or MATH 241	I					
NSCI 476		M			M	M
Required in earth science track						
ASTR 180-181		I				
ASTR 110L				I, D		
GEOG 300		D			D	
GEOL 205		I				
GEOL 300		D			D	D
MARE 201-201L		I	I, D	I, D		
UD elective		D				

Table 4. Required courses in the PHYSICS track.

Course	PLO 1 explain basic concepts, methods & theories of the natural sciences	PLO 2 Describe and explan physics concepts; describe and apply scientific methods in physics	PLO 3 independently undertake laboratory investigations; explain & follow safety protocols for teaching laboratories	PLO 4 demonstrate observational and experimental skills	PLO 5 apply scientific concepts, methods, and theories to problems of societal relevance	PLO 6 communicate scientific knowledge, orally and in writing, to a variety of audiences.
Required all tracks						
BIOL 171-172	I		I		I	
CHEM 161-162	I		I		I	
PHYS 170-272 or PHYS 151-152	I	I	I		I	
GEOL 111-112	I		I		I	
BIOL 171L-272L, CHEM 161L-162L, PHYS labs, GEOL 111L-112L	I		I, D, M	I, D, M		I, D
MATH 121 or BIOL 280	I					
MATH 125 or MATH 241	I					
NSCI 476		M			M	M
Required in physics track						
MATH 242	I					
MATH 243	I					
MATH 300	D					
PHYS 274		D				
PHYS 371		D				
PHYS 211 or PHYS 230		D	D	D		
UD elective		D, M				

Table 5. Elective courses in the allied sciences (PLO 1, 2b, 3, 4, 5).
Students select three courses (two in the physics track).

Course	PLO 3: laboratory investigations	PLO 4: observational & experimental skills	PLO 5: societal relevance	PLO 6: Communicate knowledge
AG 304			D	A few courses will address communication with a broad audience.
AG 375			D	
ANTH 481		D		
ANTH 484		D		
AQUA 425			M	
BIOL 357				
BIOL 371				
BIOL 381			D	
BIOL 443				
BIOL 445				
BIOL 455				
BIOL 457				
BIOL 460				
BIOL 467				
BIOL 477				
CHEM 274-2	M	M		
CHEM 360			D	
CHEM 431-4	M	M		
CHEM 487			M	
ENSC 301			D	
ENTO 304				
GEOG 300			D	
GEOL 300			D	
GEOL 342				
GEOL 431				
GEOL 432				
GEOL 445				
GEOL 450				
GEOL 460			M	
GEOL 472				
PHYS 330				
PHYS 331				
PHYS 341				
PHYS 360				
PPTH 404			M	
SOIL 304			D	
ED 310			D	D
ED 350			D	D
PHIL 329			D	D
PHIL 412			M	D
PHIL 416			M	D

Table 6. Elective courses in the allied sciences (PLO 2)

Students select three courses (two in the physics track).

Course	Biology track Describe, explain, and apply biology concepts & methods	Chemistry track Describe, explain, and apply chemistry concepts & methods	Earth Science Track Describe, explain, and apply earth science concepts & methods	Physics track Describe, explain, and apply physics concepts & methods
AG 304	D			
AG 375	D			
ANTH 481			D	
ANTH 484			D	
AQUA 425		M		
BIOL 357	D			
BIOL 371	D			
BIOL 381	D			
BIOL 443	M			
BIOL 445	M			
BIOL 455	M			
BIOL 457	M			
BIOL 460	M			
BIOL 467	M			
BIOL 477	M			
GEOL 432			M	
CHEM 274-274L		D	D	M
CHEM 360		D	D	
CHEM 431-431L		M	M	
CHEM 487		M		
ENSC 301			D	D
ENTO 304	D			
GEOG 300			D	D
GEOL 300			D	
GEOL 342			D	
GEOL 431			M	
GEOL 445			M	
GEOL 450			M	
GEOL 460			M	
GEOL 472			M	
PHYS 330				D
PHYS 331				D
PHYS 341				D
PHYS 360				D
PPTH 404	M			
SOIL 304			D	
ED 310				
ED 350				
PHIL 329				
PHIL 412				
PHIL 416				

SCALE	Program Learning Outcome 1: Student can describe and explain[1] basic concepts, methods, and theories of the natural sciences
4—Exceptional	Same as "competent" except that student can define and explain *most* of the scientific terms and concepts in introductory textbooks. Explanations are always clear.
3—Competent	Can accurately define and explain many of the scientific terms and concepts found in introductory textbooks. Appropriate use of scientific terminology in written and oral communication. Most of the time can clearly explain the meaning of scientific terminology in plain English. Distinguishes between valid observations, hypotheses, theories, and laws, hypothesis testing, and hypothesis generation. Describes important theories and the evidence for them and explains how these theories were developed.
2—Emerging	Can accurately define and explain some of the scientific terms and concepts found in introductory textbooks. Distinguishes between hypotheses and theories. Describes important theories and can cite some of the evidence for them.
1--Beginning	Attempts to define and explain scientific terms and concepts found in introductory textbooks ae met with < 50% success rate. Explanations lack detail and clarity.

SCALE	Program Learning Outcome 2: **Student can describe and explain scientific concepts in one of the following fields: biology, chemistry, physics, or earth science; Student can describe and apply scientific methods in one of the following fields: biology, chemistry, physics, or earth science.[2]**
4—Exceptional	Written observations and sketches are accurate, insightful, very detailed, and very comprehensive. Observations are kept separate from interpretations. Sketches are accurate, detailed, neat, and informative.
3—Competent	Written observations and sketches are accurate, relevant, detailed, and comprehensive. Observations are kept separate from interpretations. Sketches are accurate, detailed, and informative.
2—Emerging	Written observations lack detail and there are many relevant facts that student does not mention. Sketches fail to illustrate all the main features of a landscape, sample, or process. Student attempts to distinguish between facts and Interpretations, but is not always successful.
1--Beginning	Written observations lack detail and there are many relevant facts that student does not mention. Sketches fail to illustrate the main features of a landscape, sample, or process. Interpretations are confused with facts.

[1] The original wording is "articulate", however, "describe and explain" is a more assessable objective.

[2] The original wording is "Articulate a detailed understanding of scientific concepts and methods in either biology, chemistry, physics, or earth/space science." This has been rephrased to be more assessable and occupy a higher position on Bloom's taxonomy.

SCALE	Program Learning Outcome 3: **Students can successfully undertake laboratory investigations[3]; students can explain & follow safety protocols for teaching laboratories**
4—Exceptional	In addition to criteria listed under "competent", students can use their own knowledge to write safety guidelines for laboratories and field trips. Student knows which regulatory agency promulgates rules and guidance for laboratory safety. Student can write clear and complete instructions for a laboratory investigation that will be executed by others.
3—Competent	Students who meet expectations for laboratory safety will … • consistently follow safety rules for laboratories and field trips. • explain the rationale behind each safety rule and the potential consequences of safety breaches. • watch others to identify and correct breaches of safety rules. Students who are competent at laboratory investigations can … • independently execute an experiment from instructions. • identify appropriate methods of measuring mass and volume, and competently execute measurements. • identify appropriate methods of handling solid and liquid materials, and competently handle materials. • use compound and dissecting microscopes. • distinguish between accuracy and precision. • recognize and communicate measurement uncertainty. • report measurement units correctly and use significant figures correctly. • use simple classification schemes to identify common species, rock and mineral specimens, and well-preserved fossils. • read and interpret topographic and geologic maps.
2—Emerging	Students whose skills are emerging cannot explain the rationale behind safety rules and will sometimes … • fail to follow safety rules. • need assistance in executing an experiment from instructions. • be inconsistent in executing measurements or making observations of biological or geological specimens. • write reports that are not clear on what the student did and what he or she found. • report units incorrectly or fail to use significant figures when needed. • make frequent errors when identifying geologic specimens or reading maps.
1--Beginning	Student does not consistently follow safety rules. Student needs considerable help in executing an experiment or makes errors that compromise the validity of results.

[3] The original wording is "independently undertake laboratory investigations", but "successfully undertake laboratory investigations" is a better objective.

SCALE	Program Learning Outcome 4: **Demonstrate observational and experimental skills.**
4—Exceptional	In addition to accomplishments listed below under "competent", students will independently design and execute an experiment that has the potential to produce new knowledge.
3—Competent	Competent students can … • make observations that are unbiased, detailed, and informed. • distinguish between observations, interpretations, hypotheses, or suppositions. • accurately and clearly document observations, methods and results in a way that can be understood by others that were not there and had no prior knowledge of what the student did. • clearly explain the purpose and significance of an experiment. • carefully analyze experimental results to reach unbiased conclusions. • convert units to facilitate comparisons. • recognize and acknowledges problems that limit the validity of an experiment.
2—Emerging	Students whose skills are emerging may … • confuse observations and interpretations. • make observations that are missing relevant details. • write reports that are not completely clear. • fail to analyze results carefully.
1--Beginning	• Student fakes data or allows others to copy their own data. • Observations made by student are cursory or inaccurate. • Reports are incomplete and unclear.

SCALE	Program Learning Outcome 5 **Students can apply scientific concepts, methods, and theories to problems of societal relevance.**
4—Exceptional	Creatively identifies a new hypothesis or experimental study that addresses an unmet societal need. Explains the advantages and limitations of using the scientific method to solve practical problems.
3—Competent	Distinguishes between basic and applied science and gives examples of each. Identifies numerous societal problems that have been addressed using scientific information or the scientific method and explains how science contributed. Can provide detailed descriptions and explanations of how science has been used to address specific problems or issues.
2—Emerging	Recognizes examples of the use of scientific information or the scientific approach in solving practical problems.
1--Beginning	Does not distinguish between basic and applied science.

SCALE	Program Learning Outcome 6: **Students will communicate their knowledge, orally and in writing, to a variety of audiences.**
4—Exceptional	The purpose, vocabulary, explanation of concepts, and level of background information is tailored to the needs of the audience and the requirements of the assignment. Jargon is not used. Content and length are appropriate to the assignment. The content is detailed, information-dense, and relevant to the main point of the communication. The audience can understand the ideas of the author or speaker, who is sensitive to the fact that audience members may have alternative views or values. Written descriptions and explanations are relevant, complete, and accurate. Prose is clear, concise, precise, grammatically-correct, crisp, and smooth. Writing is highly-organized and follows appropriate conventions for formatting, citation, and reference list. Oral communications provide information in a logical order. Slides are legible, logical and attractive. The number of slides, amount of text, and number of illustrations is appropriate. Slides acknowledge the sources of Illustrations, data, and tables. Speech is audible and speaker maintains eye contact with the audience. Natural delivery at an appropriate pace without reading the slides or a script. There are no inappropriate pauses, interrupters, or annoying gestures.
3—Competent	For the most part, the purpose, vocabulary, explanation of concepts, and level of background information is tailored to the needs of the audience and the requirements of the assignment. Content and length are appropriate to the assignment. The content is unbiased, information-dense and relevant to the main point of the communication. In places, however, the content may be slightly skimpy or belabor certain points unnecessarily. The audience can understand the main ideas of the author or speaker. Written descriptions and explanations are relevant, complete, and accurate, with only small omissions or inaccuracies. Prose is mostly clear, reasonably concise, and is grammatically-correct. Difficult concepts are explained clearly, albeit awkwardly. Occasional small lapses of grammar, clarity, and conventions (for formatting, citations, and reference list) are tolerated. Students whose native language is not English can convey their ideas accurately, even if idiom and phrasing is awkward to the ears of native speakers.

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SCALE	Program Learning Outcome 6: Students will **communicate their knowledge, orally and in writing, to a variety of audiences.**
2—Emerging	Writing partly addresses the needs of the audience and the purpose of the assignment, Addresses some--but not all--of the information that should be conveyed and contains irrelevant information. In places it is not clear what the writer or speaker is trying to say. Writing is not concise and could be improved by stronger organization. Prose contains grammatical errors and documents do not follow all the conventions for formatting, citation, and reference list. Speaker uses vocabulary or concepts that the audience is unfamiliar with. Background information is missing or the speaker devotes too much time to what the audience already knows. Poor organization makes it is difficult for the audience to follow the speaker's ideas. Some of the slides are not legible and/or do not use illustrations effectively. There is no attempt to acknowledge sources. Amount of eye contact is inadequate, and time is too short or too long.
1--Beginning	There is no effort to identify the needs of the audience and the final product does not adhere to all the requirements of the assignment. Length is too short with skimpy content or too long due to rambling or unnecessary repetition. It is not always clear what the author or speaker is trying to say. Prose contains frequent grammatical errors and documents make no effort to follow conventions for formatting, citation, and reference list. For the oral presentation, many slides are not legible, and text has been used when illustrations would be more effective. The speaker does not look at the audience and reads from the slides or a prepared script.